

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
REQUEST FOR FILING NATIONAL PHASE OF
PCT APPLICATION UNDER 35 U.S.C. 371 AND 37 CFR 1.494 OR 1.495

To: Asst. Commissioner of Patents
Washington, D.C. 20231

524 Rec'd PCT/PTO

20 SEP 1999

09/381334



TRANSMITTAL LETTER TO THE UNITED STATES
DESIGNATED/ELECTED OFFICE (DO/EO/US)

Atty Dkt: PM 264014 | 2980022US/VK/her
M# | Client Ref.

From: Pillsbury Madison & Sutro LLP, IP Group:

Date: September 20, 1999

This is a **REQUEST** for **FILING** a PCT/USA National Phase Application based on:

1. International Application	2. International Filing Date	3. Earliest Priority Date Claimed
<u>PCT/FI99/00057</u> ↑ country code	<u>28</u> <u>January</u> <u>1999</u> Day MONTH Year	<u>28</u> <u>January</u> <u>1998</u> Day MONTH Year (use item 2 if no earlier priority)

Measured from the earliest priority date in item 3, this PCT/USA National Phase Application Request is being filed within:

(a) ☒ 20 months from above item 3 date (b) ☐ 30 months from above item 3 date,

(c) Therefore, the due date (unextendable) is September 28, 1999

Title of Invention RADIO NETWORK ACCESS MECHANISM

6. Inventor(s) VIRTANEN, Kari

Applicant herewith submits the following under 35 U.S.C. 371 to effect filing:

☒ Please immediately start national examination procedures (35 U.S.C. 371 (f)).

8. ☐ A copy of the International Application as filed (35 U.S.C. 371(c)(2)) is transmitted herewith (file if in English but, if in foreign language, file only if not transmitted to PTO by the International Bureau) including:

a. ☐ Request;

b. ☐ Abstract;

c. pgs. Spec. and Claims;

d. sheet(s) Drawing which are ☐ informal ☐ formal of size ☐ A4 ☐ 11"

9. ☒ A copy of the International Application has been transmitted by the International Bureau.

10. A translation of the International Application into English (35 U.S.C. 371(c)(2))

a. ☒ is transmitted herewith including: (1) ☒ Request; (2) ☒ Abstract;

(3) 12 pgs. Spec. and Claims;

(4) 3 sheet(s) Drawing which are:

☐ informal ☒ formal of size ☒ A4 ☐ 11"

b. ☐ is not required, as the application was filed in English.

c. ☐ is not herewith, but will be filed when required by the forthcoming PTO Missing Requirements Notice per Rule 494(c) if box 4(a) is X'd or Rule 495(c) if box 4(b) is X'd.

d. ☐ Translation statement attached (not required now).

11. ☒ **PLEASE AMEND** the specification before its first line by inserting as a separate paragraph:
 a. ☒ --This application is the national phase of international application PCT /FI99 /00057 filed January 28, 1999 which designated the U.S.--
 b. ☐ --This application also claims the benefit of U.S. Provisional Application No. 60/_____, filed _____.
12. ☐ Amendments to the claims of the International Application **under PCT Article 19 (35 U.S.C. 371(c)(3))**, i.e., **before 18th month from first priority date above in item 3**, are transmitted herewith (file only if in **English**) including:
13. ☒ PCT Article 19 claim amendments (if any) have been transmitted by the International Bureau
14. ☐ Translation of the amendments to the claims **under PCT Article 19 (35 U.S.C. 371(c)(3))**, i.e., of **claim amendments** made before 18th month, is attached (**required by 20th month from the date in item 3 if box 4(a) above is X'd, or 30th month if box 4(b) is X'd, or else amendments will be considered canceled**).
15. **A declaration of the inventor (35 U.S.C. 371(c)(4))**
 a. ☐ is submitted herewith ☐ Original ☐ Facsimile/Copy
 b. ☒ is not herewith, but will be filed when required by the forthcoming PTO Missing Requirements Notice per Rule 494(c) if box 4(a) is X'd or Rule 495(c) if box 4(b) is X'd.
16. **An International Search Report (ISR):**
 a. Was prepared by ☐ European Patent Office ☐ Japanese Patent Office ☒ Other
 b. ☒ has been transmitted by the international Bureau to PTO.
 c. ☒ copy herewith (1 pg(s).) ☒ plus Annex of family members (1 pg(s).).
17. **International Preliminary Examination Report (IPER):**
 a. ☒ has been transmitted (if this letter is filed after 28 months from date in item 3) in English by the International Bureau with Annexes (if any) in original language.
 b. ☐ copy herewith in English.
 c.1 ☐ IPER Annex(es) in original language ("Annexes" are amendments made to claims/spec/drawings during Examination) including attached amended:
 c.2 ☐ Specification/claim pages # _____ claims # _____
 Dwg Sheets # _____
 d. ☐ Translation of Annex(es) to IPER (**required by 30th month due date, or else annexed amendments will be considered canceled**).
18. **Information Disclosure Statement** including:
 a. ☒ Attached Form PTO-1449 listing documents
 b. ☒ Attached copies of documents listed on Form PTO-1449
 c. ☒ A concise explanation of relevance of ISR references is given in the ISR.
19. ☐ **Assignment** document and Cover Sheet for recording are attached. Please mail the recorded assignment document back to the person whose signature, name and address appear at the end of this letter.
20. ☐ Copy of Power to IA agent.
21. ☐ **Drawings** (complete only if 8d or 10a(4) not completed): ____ sheet(s) per set: ☐ 1 set informal; ☐ 1 set formal of size ☐ A4 ☐ 11"
22. ☐ ____ (No.) **Verified Statement(s)** establishing "small entity" status under Rules 9 & 27
23. **Priority** is hereby claimed under 35 U.S.C. 119/365 based on the priority claim and the certified copy, both filed in the International Application during the international stage based on the filing in (country) FINLAND of:
- | | Application No. | Filing Date | | Application No. | Filing Date |
|-----|-----------------|-------------------------|-----|-----------------|-------------|
| (1) | <u>980185</u> | <u>January 28, 1998</u> | (2) | _____ | _____ |
| (3) | _____ | _____ | (4) | _____ | _____ |
| (5) | _____ | _____ | (6) | _____ | _____ |
- a. ☒ See Form PCT/IB/304 sent to US/DO with copy of priority documents. If copy has not been received, **please proceed promptly to obtain same from the IB**.
 b. ☐ Copy of Form PCT/IB/304 attached.

24. Attached:
 25. **Preliminary Amendment:** Claim 4, line 1, delete " or 3 " 420 Rec'd PCT/PTO 20 SEP 1999
 Claim 5, line 1, delete " or 3 "
 Claim 6, line 1, delete " 3 or 4 "
 Claim 7, line 1, change " any one .. claims " to -- claim 1 --

25.5 Per Item 17.c3, **cancel original** pages #____, claims #____, Drawing Sheets #

26. **Calculation of the U.S. National Fee (35 U.S.C. 371 (c)(1)) and other fees is as follows:**

Based on amended claim(s) per above item(s) ☐ 12, ☐ 14, ☐ 17, ☒ 25, ☐ 25.5 (hilitte)

					Fee Code (lg/sm entity) (see box 22)
Total Effective Claims	minus 20 =	0	x \$18/\$9	= \$0	966/967
Independent Claims	minus 3 =	0	x \$78/\$39	= \$0	964/965
If any proper (ignore improper) Multiple Dependent claim is present,			add \$260/\$130	+0	968/969

BASIC NATIONAL FEE (37 CFR 1.492(a)(1)-(4)): →→ **BASIC FEE REQUIRED, NOW** →→→→→

A. If country code letters in item 1 are not "US", "BR", "BB", "TT", "MX", "IL", "NZ", "IN" or "ZA"

See item 16 re:

1. Search Report was <u>not prepared</u> by EPO or JPO -----	add \$970/\$485	960/961
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SKIP B, C, D AND E UNLESS country code letters in item 1 are "US", "BR", "BB", "TT", "MX", "IL", "NZ", "IN" or "ZA"

→ <input type="checkbox"/> B. If <u>USPTO</u> did not issue <u>both</u> International Search Report (ISR) <u>and</u> (if box 4(b) above is X'd) the International Examination Report (IPER), -----	add \$970/\$485	+0	960/961
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→ <input type="checkbox"/> E. If international preliminary examination fee was paid to <u>USPTO and</u> Rules 492(a)(4) and 496(b) <u>satisfied</u> (IPER Sec. V <u>all</u> 3 boxes YES for <u>all</u> claims), -----	add \$96/\$48	+0	962/963

27. **SUBTOTAL = \$970**

28. If Assignment box 19 above is X'd, add Assignment Recording fee of ----\$40 +0 581

29. Attached is a check to cover the ----- **TOTAL FEES \$970**

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This CHARGE STATEMENT does not authorize charge of the issue fee until/unless an issue fee transmittal form is filed

Pillsbury Madison & Sutro LLP
Intellectual Property Group

1100 New York Avenue, N.W.
 Ninth Floor East Tower
 Washington, D.C. 20005-3918
 Tel: (202) 861-3000
 Atty/Sec: BXS/mhn

By: Atty: Brian Sirtzky

Sig: [Signature]

Reg. No. 37497

Fax: (202) 822-0944

Tel: (202) 861-3702

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APPLICATION UNDER UNITED STATES PATENT LAWS

Invention: RADIO NETWORK ACCESS MECHANISM

Inventor(s): VIRTANEN, Kari

Pillsbury Madison & Sutro LLP
Intellectual Property Group
1100 New York Avenue, N.W.
Ninth Floor, East Tower
Washington, D.C. 20005-3918
Attorneys
Telephone: (202) 861-3000

This is a:

- ☐ Provisional Application
- ☐ Regular Utility Application
- ☐ Continuing Application
- ☒ PCT National Phase Application
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Sub. Spec. filed _____
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Sub. Spec. filed _____
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SPECIFICATION

420 Rec'd PCT/PTO 20 SEP 1999

RADIO NETWORK ACCESS MECHANISM**BACKGROUND OF THE INVENTION**

The invention relates to reduction of signalling load when a multi-mode (e.g. GSM/GPRS) mobile station registers in a packet radio network, such as GPRS. The invention is described in connection with a dual-mode telecommunications system which supports two different networks. To clarify the description, it is assumed that the first network is a circuit-switched network (such as GSM) and the second network is a packet-switched network (such as GPRS). Instead of the GSM network, or in addition to it, derivatives of the GSM, such as DCS, may also be used.

A General Packet Radio Service (GPRS) is a new service in the GSM. It is one of the items that is being standardized in GSM phase 2+ in the ETSI (European Telecommunication Standard Institute). The GPRS operational environment consists of one or more sub-network service areas that are interconnected using a GPRS backbone network. A sub-network comprises a number of packet data service nodes, which are here called GPRS support nodes (or agents) and each one of which is connected to the GSM mobile network so that it can provide packet data service for mobile data terminals via several base stations, i.e. cells. An intermediate mobile network provides circuit-switched or packet-switched data transmission between a support node and the mobile data terminals. Different sub-networks, in turn, are connected to an external data network, for example to a Public Switched Packet Data Network PSPDN. The GPRS service can thus be used for effecting packet data transmission between mobile data terminals and external data networks, when the GSM network functions as an access network. One feature of the GPRS service network is that it operates almost independently of the GSM network. One of the requirements set for the GPRS service is that it must operate together with different types of external PSPDN networks, such as the Internet and X.25 networks. In other words, the GPRS service and the GSM network should be able to serve all users, irrespective of the type of data networks that they wish to be connected to via the GSM network. This means that the GSM network and GPRS service must support and process different network addressing methods and data packet formats. The data packet processing also comprises routing of the packets in a packet radio network. In

addition, the users should be able to roam from their home GPRS network to a visited GPRS network.

Figure 1 illustrates a typical arrangement in a GPRS network. It should be understood that the architecture of the GPRS networks is not as mature as that of the GSM networks. All GPRS terms should therefore be understood as being descriptive terms rather than limiting ones. A typical mobile station forming a mobile data terminal consists of a mobile station MS of a mobile network and of a portable computer PC connected to the data interface of the MS. The mobile station may be, for example, a Nokia 2110, manufactured by Nokia Mobile Phones Ltd., Finland. By means of a PCMCIA type Nokia Cellular Datacard, manufactured by Nokia Mobile Phones Ltd., the mobile station can be connected to any portable personal computer PC whatsoever that has a PCMCIA card slot. The PCMCIA card thus provides the PC with an access point that supports the protocol of the telecommunications application used in the PC, such as the CCITT X.25 or Internet Protocol IP. Alternatively, the mobile station can directly provide an access point that supports the protocol used by the PC application. Further, a mobile station 3 and a PC 4 can be integrated to form a single unit, within which the application is provided with an access point that supports the protocol used by it. An example for such a mobile station with an integrated computer is a Nokia Communicator 9000, manufactured by Nokia Mobile Phones Ltd., Finland.

Network elements BSC and MSC are previously known from a typical GSM network. The arrangement of Figure 1 comprises a separate Serving GPRS Support Node SGSN. The support node controls certain operations of the packet radio service on the network side. The operations include the logging on and off the system by the mobile stations MS, updating of the routing areas of the mobile stations MS, and routing of the data packets to correct destinations. In the present application, the term 'data' should be understood in the wide sense to mean any information whatsoever transmitted in a digital telecommunications system. The information can comprise speech encoded into digital form, data communication between computers, telefax data, short segments of program code, etc. The SGSN node can be located at a base station BTS, at a base station controller BSC or at a mobile switching centre MSC, or it can be separate from all these elements. The interface between the SGSN node and the base station controller BSC is called a GB

interface. An area managed by one base station controller BSC is called a Base Station Subsystem BSS.

The intermediate mobile network provides packet-switched data transmission between a support node and mobile data terminal equipment.

5 Different sub-networks, in turn, are connected to an external data network, for example to a PSPDN, via specific Gateway GPRS Support Nodes GGSN. Packet data transmission between mobile data terminals and external data networks is thus effected by means of the GPRS service, while the GSM network functions as an access network. Alternatively, the gateway node
10 GGSN can be replaced with a router. In the following, the term 'gateway node GGSN' is also to be understood as referring to a structure in which the gateway has been replaced with a router.

In Figure 1 the GPRS network connected to the GSM network comprises a number of serving GPRS support nodes and one gateway GPRS
15 support node GGSN. The different support nodes SGSN and GGSN are interconnected via an intra-operator backbone network. It is to be understood that a GPRS network may comprise any number of support nodes SGSN and gateway nodes GGSN.

Each support node SGSN manages a packet data service in the
20 area of one or more nodes in a cellular packet radio network. To achieve this, each support node SGSN is connected to a certain local part of the GSM system, typically to a mobile services switching centre, but in some situations it may be preferable to connect it directly to a base station subsystem BSS, i.e. to a base station controller BSC or a base station BTS. A mobile station MS in
25 a cell communicates with a base station BTS over a radio interface and further through a mobile network with the support node SGSN to the service area of which the cell belongs. In principle, the mobile network between the support node SGSN and the mobile station MS only transmits packets between these two. For this purpose, the mobile network can offer either a circuit-switched
30 connection or packet-switched data packet transmission between a mobile station MS and a serving support node SGSN. An example for a circuit-switched connection between a mobile station MS and an agent is presented in WO 95/08900. An example for packet-switched data transmission between a mobile station MS and an agent is presented WO 95/20283. It should be
35 noted, however, that a mobile network provides only a physical connection

between a mobile station MS and a support node SGSN, and that its exact operation and structure are not relevant to the present invention.

An intra-operator backbone network 11 interconnecting the operator's SGSN and GGSN can be implemented, for example, using a local area network. It should be noted that it is also possible to implement the operator's GPRS network without an intra-operator backbone network, for example, by implementing all the features in a single computer, but this does not cause any changes in the call set-up principles according to the present invention.

A gateway GPRS node GGSN connects the operator's GPRS network to the other operators' GPRS networks and to data networks, such as an inter-operator backbone network 12 or an IP network. An Interworking Function IWF can be arranged between the gateway node GGSN and the other networks, but usually the GGSN is simultaneously the IWF. The inter-operator backbone network 12 is one through which the gateway nodes GGSN of different operators can communicate with one another. The communication is needed to support the GPRS roaming between the different GPRS networks.

The gateway node GGSN is also used for storing the location information of the GPRS mobile stations. The GGSN also routes mobile-terminated (MT) data packets. The GGSN also contains a database that associates the mobile station's network address, for example in an IP network or an X.25 network (or simultaneously in more than one network), and the mobile station identifier in a GPRS network. When the mobile station roams from one cell to another within the area of one support node SGSN, location updating is needed only in the support node SGSN, and the gateway node GGSN need not be informed of the change of location. When the mobile station roams from a cell of one support node SGSN to a cell of another SGSN within the area of the same or a different operator, location updating is also performed in the (home) gateway node GGSN so as to store the identifier of the new, visited support node and the identifier of the mobile station.

A home location register HLR is also used to authenticate subscribers at the beginning of a GPRS session. It contains a definition between a subscriber's PDP (Packet Data Protocol) address (addresses) and the subscriber's IMSI (International Mobile Subscriber Identity). In a GSM network a subscriber is identified on the basis of the IMSI. In Figure 1 the HLR

is connected through an SS7 (Signalling System 7), for example to a mobile switching centre MSC and an intra-operator backbone network. Between the SS7 signalling system and the intra-operator backbone network there can be a direct connection or an SS7 gateway. In principle, the HLR can exchange packet-switched messages with any GPRS node whatsoever. The HLR's method of communication and its connection to the GPRS network are not, however, essential to the invention.

In the above arrangement, packet-switched data (in short: packet data) can be transmitted to a mobile station over an air interface, when the mobile station, controlled by the network, has first been directed to a correct kind of channel, i.e. to a packet data transmission channel. A mobile station that supports packet data transmission can either be suited only to the transmission and reception of packet data ('GPRS only') or also to the transmission of conventional circuit-switched speech and other services ('multi-function terminal').

A 'GPRS only' mobile station can be in one of three different modes in the sense of the present application: a ready, a standby or an idle mode. A mobile station in the ready mode is connected to a data transmission channel and is ready to transmit and/or receive data packets. A mobile station in the standby mode listens to a packet data paging channel, and after receiving its paging identifier the mobile station switches to the ready mode. A mobile station in the idle mode does not support transmission nor reception of packet data.

A multi-function terminal operates in the ready and standby modes in the same way as the 'GPRS only' terminal, but in the idle mode it supports conventional circuit-switched services.

When packet data is sent to a mobile station, the data will be routed to the correct GSM network by routing it via the gateway node GGSN to the support node SGSN in which the location of the mobile station is known. If the mobile station is in the standby mode, its location is known with the accuracy of a Routing Area RA. Correspondingly, if the mobile station is in the ready mode, its location is known with the accuracy of a cell.

Figure 2 illustrates registration of a mobile station in the system. Figure 2 is taken from the ETSI specification GSM 03.60 (version 5.2.0). The previous support node SGSN and centre MSC/VLR of the mobile station are called "the old ones" and their present counterparts are called "the new ones".

In step 2-1 the mobile station sends an ATTACH REQUEST message. Steps 2-2 to 2-5 are neither necessary nor essential to the invention, and thus they will not be described here. In step 2-6a the new SGSN sends an UPDATE LOCATION message to the home location register HLR, which in step 2-6b
5 cancels the location (CANCEL LOCATION) from the old SGSN. In step 2-6c the old SGSN acknowledges (=ACK). In step 2-6d the new SGSN receives subscriber data from the home location register in a message INSERT SUBSCRIBER DATA and sends an acknowledgement in step 2-6e. In step 2-6f the new SGSN receives an acknowledgement to the update location
10 message which was sent in step 2-6a.

In step 2-7a the new SGSN sends a LOCATION UPDATING REQUEST to the new centre MSC/VLR. Steps 2-7b to 2-7g correspond to steps 2-6a to 2-6f. In step 2-7h the new SGSN receives an acknowledgement to the location updating request sent in step 2-7a from the new centre. In step
15 2-8 the new SGSN informs the mobile station of the fact that the attach request sent in step 2-1 has been accepted. The following steps are not essential to the invention, and thus they will not be explained more closely.

A problem related to the arrangement described above is that the GPRS side of the system has no subscriber-specific information on whether a
20 certain subscriber has access to the service on the GSM side (MSC/VLR). When a mobile station PC/MS registers in the system, a combined GPRS/non-GPRS IMSI attach operation and possibly a location area/routing area (LA/RA) update to the visitor location register MSC/VLR are carried out. This causes unnecessary signalling to the MSC/VLR via the Gs interface and
25 further to the home location register HLR via the MAP-D interface if the subscriber is only a GPRS subscriber.

A parallel problem arises when the GSM side of the system has no subscriber-specific information on whether a certain subscriber has access to
30 the service on the GPRS side (SGSN). This causes unnecessary signalling if the VLR has lost the subscriber data. In the case of a mobile-terminating call, a page has to be always sent to each SGSN node since the MSC/VLR does not know whether the subscriber has a GPRS service or not.

BRIEF DESCRIPTION OF THE INVENTION

It is an object of the invention to provide a method and an
35 apparatus implementing the method, eliminating the above-mentioned

problems related to unnecessary signalling. The objects of the invention are achieved by a method and an apparatus which are characterized by what is disclosed in the independent claims. Preferred embodiments of the invention are disclosed in the dependent claims.

5 First of all, the invention is based on finding the problem. Since the excessive signalling caused by conventional solutions does not necessarily cause actual error situations and GSM/GPRS networks are not in use yet, it is not that easy to detect the problem. In addition to finding the problem, the invention is based on finding a solution which causes as few compatibility
10 problems and changes to the function of other network elements as possible. It is not desirable to make great changes to the definitions of network elements because of a relatively small problem.

The invention comprises maintaining a subscriber-specific access parameter, which indicates what rights the subscriber in question has in both
15 networks. The access parameter is transmitted to a relevant network element on registration in the system. The advantages of the invention, such as decrease of the signalling load, are the greatest if the first network and the second network have clearly different architectures. This is the case for example when the first network is a circuit-switched network (such as GSM, DSC, etc.) and the second network is a packet-switched network (such as
20 GPRS).

An advantage of the method and arrangement of the invention is that they solve a non-obvious problem in a simple manner. In other words, the invention eliminates unnecessary signalling load when a mobile station registers in the system. The invention also surprisingly provides a solution to
25 several other separate problems, as will be described below.

According to a first embodiment of the invention, the subscriber-specific access parameter is maintained in the home location register. An advantage of this embodiment is that no changes are needed in the mobile
30 stations and their SIM cards.

According to a second embodiment of the invention, the subscriber-specific access parameter is maintained in the mobile station, in particular in its SIM card (Subscriber Identity Module). An advantage of this embodiment is that the signalling load decreases considerably. On the other hand, changes
35 have to be made to the mobile stations, at least to their SIM cards.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be described in greater detail by means of preferred embodiments with reference to the accompanying drawings, in which

Figure 1 illustrates an architecture of a GSM/GPRS system;

Figure 2 illustrates registration of a mobile station in the system according to the prior art;

Figure 3 illustrates registration of a mobile station in the system according to a first embodiment of the invention;

Figure 4 illustrates how the invention solves a separate problem which arises when the data of the visitor location register disappear.

DETAILED DESCRIPTION OF THE INVENTION

Figure 3 illustrates registration of a mobile station in the system according to the solution of the invention. In Figure 3 the same numbers have the same significance as in Figure 2, except when there are some changes in the messages, in which case the first number of a message is 3. An access parameter PARAM of the invention indicates whether the subscriber has access to the GSM network, the GPRS network or to both networks. According to a first embodiment, the access parameter is maintained in the subscriber data of the home location register HLR. In the figure message 3-6d corresponds to message 2-6d described in connection with figure 2, except that an access parameter PARAM according to the invention is associated with message 3-6d. In this case it is assumed that the subscriber has access only to the GPRS network. Since the new SGSN knows that the subscriber has no access to the GSM network, steps 2-7a to 2-7h are not needed at all when the solution of the invention is used. Instead of message 2-8, message 3-8 ATTACH RESPONSE is used, which conveys information to the mobile subscriber on the fact that he has only GPRS rights. Message 2-10 is not needed. It is not necessary to transmit data on a subscriber who has no GSM rights to the visitor location register of the new centre.

According to a second embodiment of the invention, the subscriber-specific access parameter is maintained in the mobile station, particularly in its SIM card. In that case, a mobile station whose SIM card has information only on the GPRS rights decides independently not to even try to register in the GSM network. Decrease of the signalling load is complete since there would be no signals in a signalling chart corresponding to Figure 3.

Figure 4 illustrates how the invention solves another separate problem. Figure 4 illustrates set-up of a mobile terminating call when the data of the visitor location register VLR have disappeared, for example during equipment maintenance or program updating. In step 4-1 the HLR requests a roaming number from the VLR. In step 4-2 the VLR requests authentication data from the HLR. In step 4-3 the VLR requests the HLR to send back the lost data. In optional step 4-4 the subscriber is set under trace. In step 4-5 the HLR sends the subscriber data to the VLR in the message INSERT SUBSCRIBER DATA. (The access parameter PARAM illustrated in step 4-5 does not exist in the functionality according to the prior art.) In step 4-7 the mobile station MS receives a mobile-terminating call or a short message via the centre MSC. However, the visitor location register does not have subscriber location data, and thus in step 4-8 it requests the centre to search for the mobile station (SEARCH FOR MS). According to the prior art, a page has to be sent to the mobile station in step 4-9 via each of the base station systems BSS₁ to BSS_n under the centre MSC and also via each of the support nodes SGSN₁ to SGSN_n.

According to the invention, the above-described subscriber-specific access parameter PARAM, which indicates whether the subscriber has access to the GSM network, the GPRS network or to both networks, is associated with message 4-5. In step 4-9 paging of a mobile station can be substantially reduced if paging is limited to the network (GSM and/or GPRS) to which the subscriber in question has access. If the subscriber has no access to the GPRS network, paging via the SGSN nodes is unnecessary.

The invention also solves other problems. According to the prior art, an operator cannot explicitly restrict the access of a subscriber to only one network if the subscriber has a short message service SMS in use because the same subscriber data are valid both on the GSM and the GPRS sides of the network. Since the subscriber can register both in the GSM and the GPRS networks, he may reserve resources from both networks (e.g. from temporary registers), even though the services of only one network were available to the subscriber in addition to the short message service (e.g. only GSM + SMS or GPRS + SMS).

Since according to the invention the parameter indicating to which network the subscriber has access (GSM, GPRS or both) can be set explicitly for the subscriber, the operator may optimize the use of the system. This

particularly concerns subscribers to the short message service. According to the prior art, the SMS subscription in the home location register enables access both to the GSM and the GPRS networks. According to the invention, the operator may optimize the use of the system by setting the subscribers
5 who have access only to the GPRS network and short message service to the state "only GPRS network allowed".

The invention also reduces the use of network resources by preventing a subscriber from registering in a wrong network (GSM or GPRS). If the subscriber is for example a GPRS subscriber without the short message
10 service, he may try to register in the GSM network, which loads the network unnecessarily.

It is obvious to a person skilled in the art that as the technology advances, the inventive concept can be implemented in several different ways. Thus the invention and its embodiments are not limited to the examples
15 describe above, but may vary within the scope of the claims.

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CLAIMS

1. A method of registration in a telecommunications system by a mobile station, which system comprises a home location register (HLR) for maintaining subscriber data and supports a first network, such as GSM, and a
5 second network, such as GPRS;

the method comprising the steps of: maintaining the mobile subscriber data in the home location register (HLR), and sending, from another network element, a message (2-6a, 4-3) to the home location register (HLR) for requesting the mobile subscriber data;

10 **characterized** in that

the home location register (HLR) maintains an access parameter (PARAM) which indicates whether the mobile subscriber is entitled to use the first network, the second network or both networks;

15 in response to said message for requesting the subscriber data, the home location register sends the mobile subscriber data and also said access parameter;

the network element that requested the mobile subscriber data uses said access parameter for restricting the access of the mobile subscriber only to the first network or to the second network.

20 2. A method of registration in a telecommunications system by a mobile station, which system comprises a home location register (HLR) for maintaining subscriber data and supports a first network, such as GSM, and a second network, such as GPRS;

25 the method comprising storing mobile subscriber data in the memory of a mobile station, preferably in its SIM card;

characterized in that

an access parameter (PARAM) indicating whether the mobile subscriber is entitled to use the first network, the second network or both networks is also stored in the memory of the mobile station;

30 the mobile station uses said access parameter to restrict the access of the mobile subscriber only to the first and/or the second network.

3. A method according to claim 1 or 2, **characterized** in that the mobile subscriber's access can be restricted only to one network even though a short message service had been defined for the mobile subscriber.

4. A method according to claim 1 or 3, **characterized** in that the network element that requested the mobile subscriber data uses said access parameter to prevent location updating (2-7) in a network which the mobile subscriber is not entitled to use.

5 5. A method according to claim 2 or 3, **characterized** in that the mobile station independently decides not to send an attach request (2-1) in a network which the mobile subscriber is not entitled to use.

6. A method according to claim 1, 3 or 4, **characterized** in that the telecommunications system comprises a visitor location register (VLR)
10 known per se; and

when a mobile station which is in the area of the visitor location register receives a call or a short message and the visitor location does not have data of the mobile subscriber in question, said access parameter (PARAM) is used for restricting paging (4-9) of the mobile station only to a
15 network which the mobile subscriber is entitled to use.

7. A method according to any one of the preceding claims, **characterized** in that the first network is a circuit-switched network, such as GSM/DCS, and the second network is a packet-switched network, such as GPRS.

20 8. A data structure which comprises mobile subscriber data in a telecommunications system which supports a first and a second network;

characterized in that the data structure also comprises an access parameter (PARAM) which indicates whether the mobile subscriber is entitled to use the first network, the second network or both networks.

25 9. A data structure according to claim 8, **characterized** in that it is located in the home location register (HLR) of the telecommunications system.

10. A data structure according to claim 8, **characterized** in that it is located in the memory of the mobile station, preferably in its SIM card.

30 11. A data structure according to any one of claims 8 to 10, **characterized** in that the first network is a circuit-switched network, such as GSM/DCS, and the second network is a packet-switched network, such as GPRS.

Fig. 1

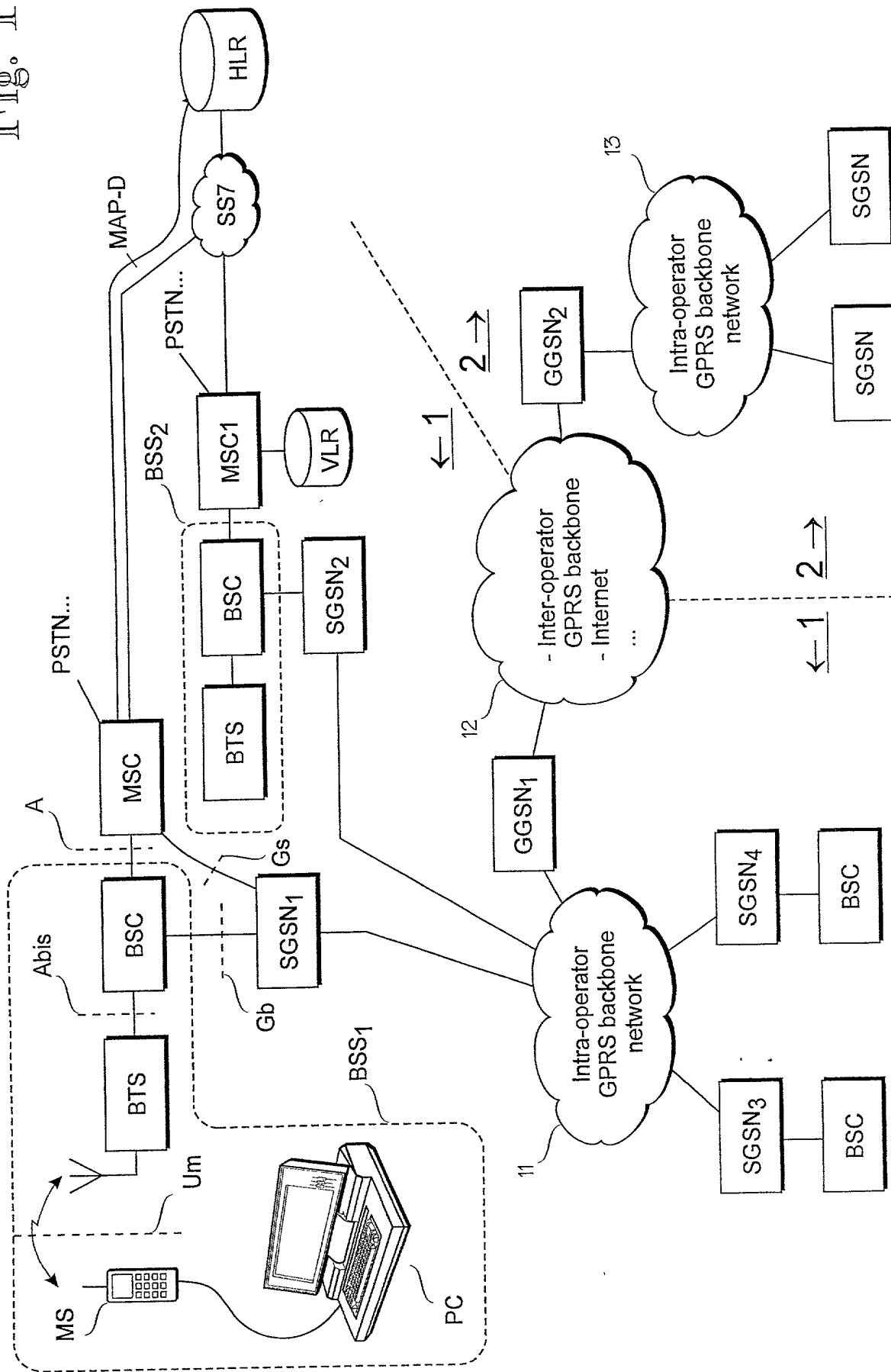


Fig. 2

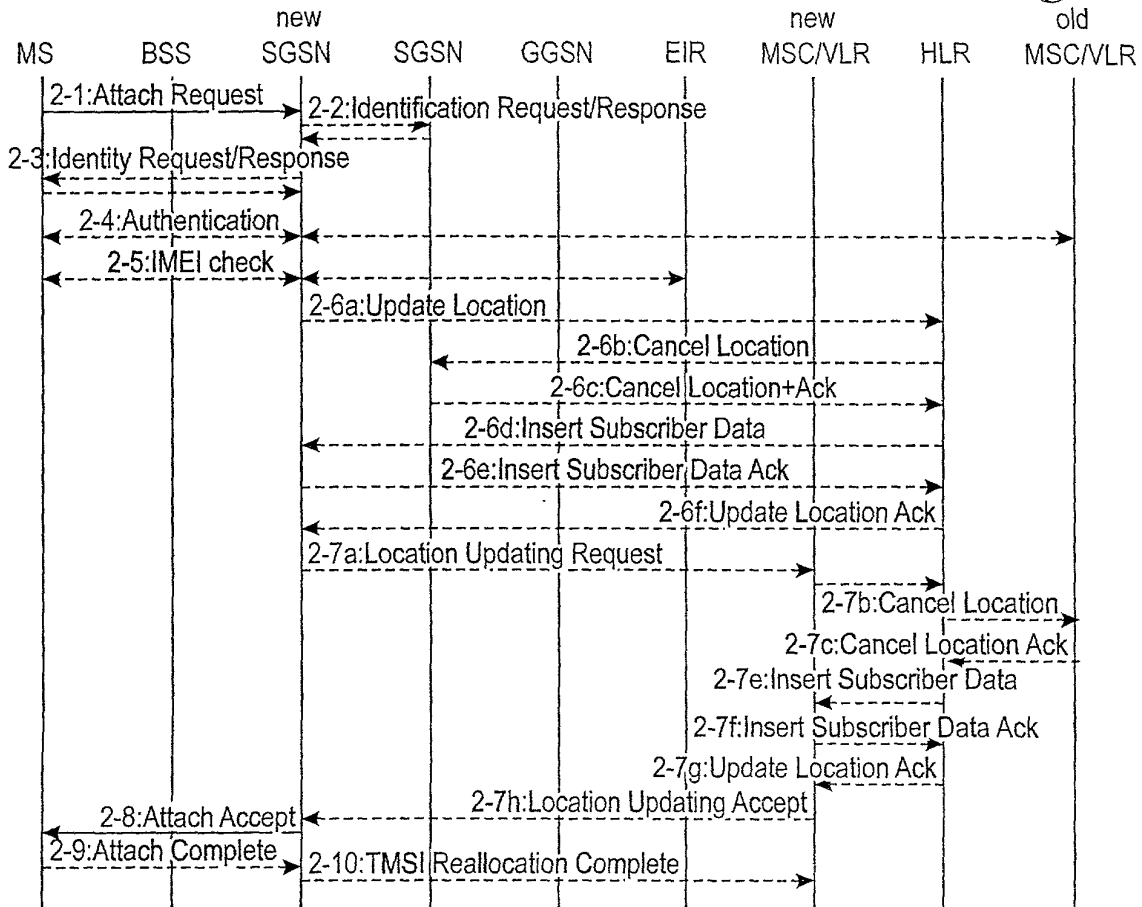
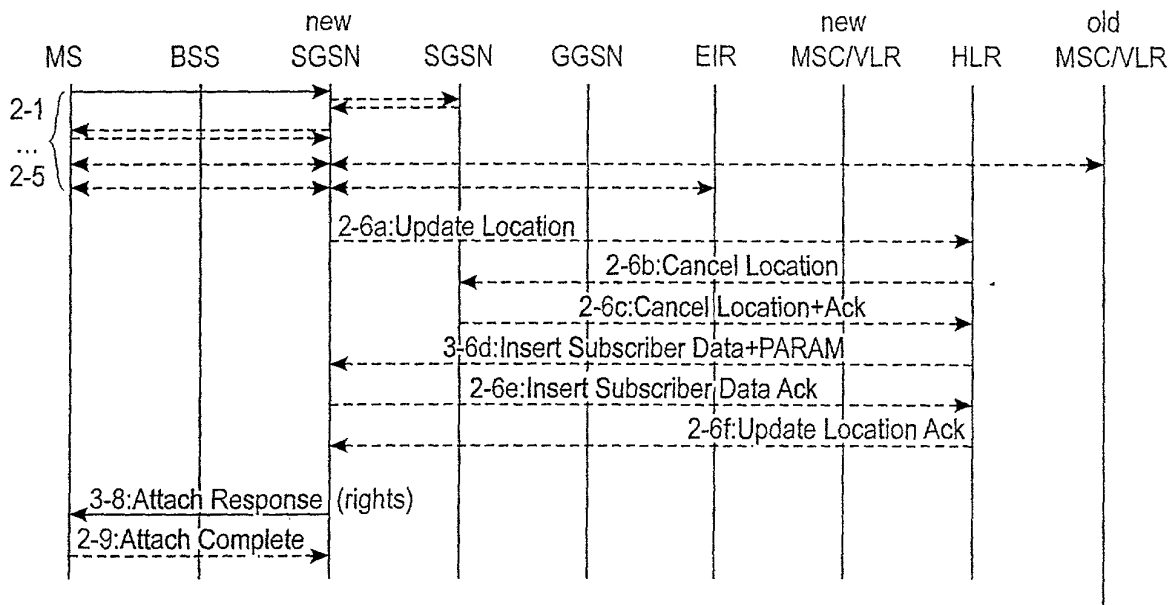
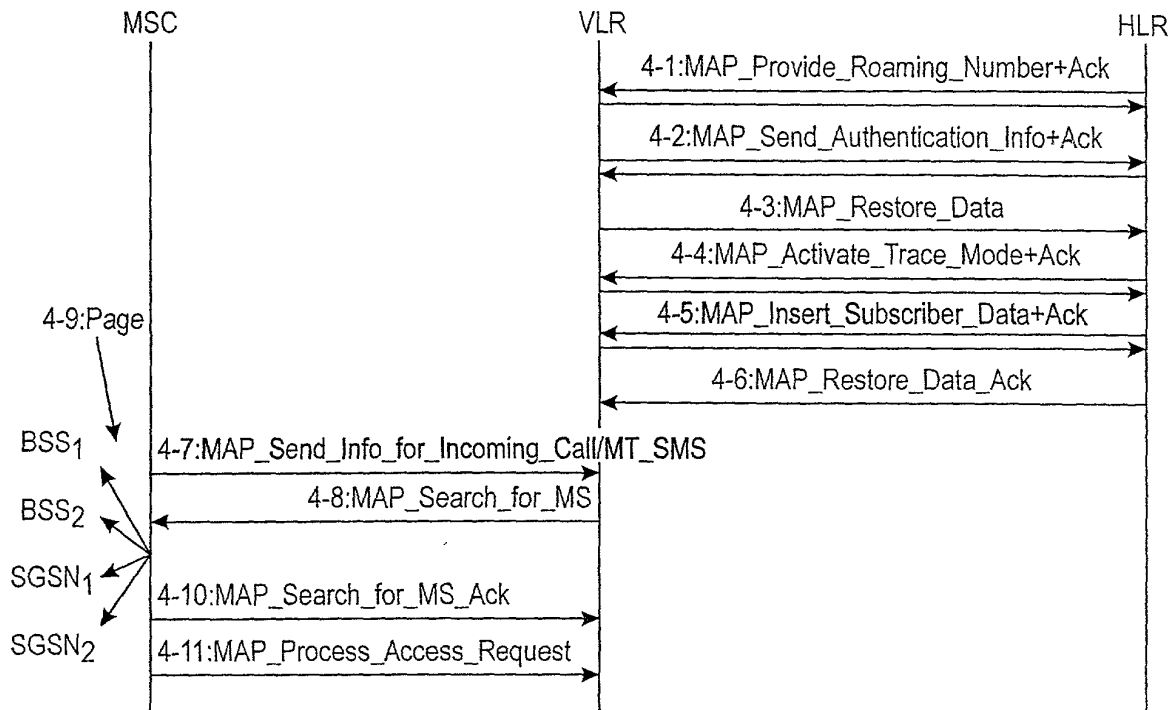


Fig. 3





FOR UTILITY/DESIGN
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DECLARATIONS

RULE 63 (37 C.F.R. 1.63)
DECLARATION AND POWER OF ATTORNEY
FOR PATENT APPLICATION
IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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FORM

As a below named inventor, I hereby declare that my residence, post office address and citizenship are as stated below next to my name, and I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the INVENTION ENTITLED

radio network access mechanism

the specification of which (CHECK applicable BOX(ES))

X → A. ☐ is attached hereto.

BOX(ES) → B. ☐ was filed on

as U.S. Application No.

→ C. ☒ was filed as PCT International Application No. PCT/ F199 / 00057 on 28 January 1999

and (if applicable to U.S. or PCT application) was amended on

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above. I acknowledge the duty to disclose all information known to me to be material to patentability as defined in 37 C.F.R. 1.56. I hereby claim foreign priority benefits under 35 U.S.C. 119(a)-(d) or 365(b) of any foreign application(s) for patent or inventor's certificate, or 365(a) of any PCT International Application which designated at least one other country than the United States, listed below and have also identified below any foreign application for patent or inventor's certificate, or PCT International Application, filed by me or my assignee disclosing the subject matter claimed in this application and having a filing date (1) before that of the application on which priority is claimed, or (2) if no priority claimed, before the filing date of this application:

PRIOR FOREIGN APPLICATION(S)

Number	Country	Day/MONTH/Year Filed
980185	FI	28 Jan. 1998

Date first Laid- open or Published

Date Patented or Granted

Priority Claimed	
Yes No	
X	

I hereby claim domestic priority benefit under 35 U.S.C. 119(e) or 120 and 365(c) of the indicated United States applications listed below and PCT international applications listed above or below and, if this is a continuation-in-part (CIP) application, insofar as the subject matter disclosed and claimed in this application is in addition to that disclosed in such prior applications, I acknowledge the duty to disclose all information known to me to be material to patentability as defined in 37 C.F.R. 1.56 which became available between the filing date of each such prior application and the national or PCT international filing date of this application:

PRIOR U.S. PROVISIONAL, NONPROVISIONAL AND/OR PCT APPLICATION(S)

Application No. (series code/serial no.)	Day/MONTH/Year Filed
--	----------------------

Status
pending, abandoned, patented

Priority Claimed
Yes No

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

And I hereby appoint Pillsbury Madison & Sutro LLP, Intellectual Property Group, 1100 New York Avenue, N.W., Ninth Floor, East Tower, Washington, D.C. 20005-3918, telephone number (202) 861-3000 (to whom all communications are to be directed), and the below-named persons (of the same address) individually and collectively my attorneys to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith and with the resulting patent, and I hereby authorize them to delete names/numbers below of persons no longer with their firm and to act and rely on instructions from and communicate directly with the person/assignee/attorney/firm/ organization who/which first sends/sent this case to them and by whom/which I hereby declare that I have consented after full disclosure to be represented unless/until I instruct the above firm and/or a below attorney in writing to the contrary.

Paul N. Kokulis	16773	Dale S. Lazar	28872	Mark G. Paulson	30793	Michael R. Dzwonczyk	36787
Raymond F. Lippitt	17519	Paul E. White, Jr.	32011	Stephen C. Glazier	31361	W. Patrick Bengtsson	32456
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Kevin E. Joyce	20508	G. Paul Edgell	24238	Richard H. Zaitlen	27248		
George M. Sirilla	18221	Lynn E. Eccleston	35861	Roger R. Wise	31204		
Donald J. Bird	25323	Timothy J. Klima	34852	Jay M. Finkelstein	21082		
Peter W. Gowdey	25872	David A. Jakopin	32995	Anita M. Kirkpatrick	32617		

(1) INVENTOR'S SIGNATURE:

Date:

Kari		Virtanen	
First	Middle Initial	Family Name	
Residence	Tampere	Finland	Finland
City	State/Foreign Country		
Post Office Address	Tohtorinkatu 34 D 17, FIN-33720 Tampere, Finland		
(include Zip Code)			

(2) INVENTOR'S SIGNATURE:

Date:

First	Middle Initial	Family Name	
Residence			
City	State/Foreign Country		
Post Office Address			
(include Zip Code)			

(FOR ADDITIONAL INVENTORS, check box ☐ to attach PAT 116-2 same information for each re signature, name, date, citizenship, residence and address.)